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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/858,337	05/15/2001	William J. Schaff	1153.044US1	1100

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EXAMINER	
DUONG, KHANH B	
ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 06/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/858,337	SCHAFF ET AL.	
	Examiner	Art Unit	
	Khanh B. Duong	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 March 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *17-19* is/are allowed.

6)☒ Claim(s) *1-9 and 11-15* is/are rejected.

7)☒ Claim(s) *10 and 16* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

This office action is in response to the filing of the amendment filed March 17, 2005.

Accordingly, no claim was amended.

Currently, claims 1-19 remain pending in the application.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Huang et al. (US 5,719,088).

Huang et al. ("Huang"), cited in the previous Office Action, discloses a method of forming a channel heterojunction field effect transistor [see FIG. 1-6] comprising the steps of: forming a channel heterojunction field effect transistor having a top surface; and applying an AlN layer 25 to the top surface of the heterojunction field effect transistor 20. Huang et al. states at column 3, lines 55-59 that the AlN layer 25 is being employed as an etch stop layer to ensure that the etching process stops at the AlN layer 25 and reduces the possibility of incidental damage inherently to the layers below. Since the AlN etch stop layer 25 also functions as a protective layer for the layers below during the etching process as previously disclosed, it is appropriate to refer to such layer as a "passivation layer".

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 2, 5 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang in view of Yoshida (U.S. 6,281,099).

Huang discloses a method of forming an AlN layer on a channel heterojunction field effect transistor previously as described, which method is repeated herein.

Re claims 2, 5 and 9, Huang fails to show using a molecular beam epitaxy process (MBE) to form the AlN layer to a desired thickness of approximately 500 to 2000 angstroms.

Yoshida, cited in the previous Office Action, suggests forming an AlN layer using MBE wherein beams of Al and RF nitrogen are appeared to be applied simultaneously until a desired thickness between 0.05-1.0 microns (50-10,000 angstroms) is obtained [see col. 2, lines 45-48].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Huang with the teaching of Yoshida by forming an AlN layer

using MBE processing, since Yoshida stated at column 1, lines 32-36, that such modification would provide an AlN layer having low resistivity and excellent in electrical conductivity and thermal conductivity.

Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select a thickness for the AlN layer within the range as suggested by Yoshida, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang in view of Parmenter et al. (U.S. 5,026,454).

Re claims 3 and 4, Huang fails to show Al and N being applied alternately until a desired thickness of AlN is obtained.

Parmenter et al. ("Parmenter") teaches in FIG. 1 an MBE apparatus that utilizes shutters 21 and 24 to alternately open and close molecular or atomic beam sources 1 and 2, wherein the beams 1 and 2 are alternately applied for approximately 0.2 seconds or less, or for any length of time required by the deposition process [see col. 2, lines 52-65].

Since Huang and Parmenter are both from the same field of endeavor, the purpose disclosed by Parmenter would have been recognized in the pertinent prior art of Huang.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Huang with the teaching of Parmenter, since Parmenter states at column 1, line 34 to 35 that such modification would achieve accurate dosage of material at the substrate.

Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang in view of Yoshida as applied to claims 2, 5 and 9 above, and further in view of Parmenter.

Re claims 6-8, the combined disclosure of Huang and Yoshida fails to disclose alternately applying Al and RF nitrogen beams at a predetermined amount of time between the alternating beams.

Parmenter et al. ("Parmenter") teaches in FIG. 1 an MBE apparatus that utilizes shutters 21 and 24 to alternately open and close molecular or atomic beam sources 1 and 2, wherein the beams 1 and 2 are alternately applied for approximately 0.2 seconds or less, or for any length of time required by the deposition process [see col. 2, lines 52-65].

Since Huang, Yoshida and Parmenter are from the same field of endeavor, the purpose disclosed by Parmenter would have been recognized in the pertinent prior art of Huang and Yoshida.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined process of Huang and Yoshida with the teaching of Parmenter, since Parmenter states at column 1, line 34 to 35 that such modification would achieve accurate dosage of material at the substrate.

Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select a process time between alternating beams as taught by Parmenter, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Claims 11-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Utumi in view of Parmenter and Yoshida.

Utumi discloses method of forming a layer of AIN of desired thickness [see col. 6, lines 62 to col. 7, lines 12] on a semiconductor substrate, the method comprising: using molecular beam epitaxy (MBE): applying beams of A1; and applying beams of remote plasma RF nitrogen with the beams of Al to produce the layer of AIN of desired thickness.

Re claim 11-15, Utumi fails to disclose alternately applying the beams of remote plasma RF nitrogen and the beams of Al at specific process parameters such as time and thickness as claimed.

Parmenter et al. ("Parmenter") teaches in FIG. 1 an MBE apparatus that utilizes shutters 21 and 24 to alternately open and close molecular or atomic beam sources 1 and 2, wherein the beams 1 and 2 are alternately applied for approximately 0.2 seconds or less, or for any length of time required by the deposition process [see col. 2, lines 52-65].

However, Parmenter fails to mention any specific desired thickness of the AlN layer.

Yoshida, as previously discussed above, suggests forming an AlN layer using MBE until a desired thickness between 0.05-1.0 microns (50-10,000 angstroms) is obtained [see col. 2, lines 45-48].

Since Utumi, Parmenter and Yoshida are all from the same field of endeavor, the purposes disclosed by Parmenter and Yoshida would have been recognized in the pertinent prior art of Utumi.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Utumi with the teaching of Parmenter, since Parmenter states

at column 1, line 34 to 35 that such modification would achieve accurate dosage of material at the substrate.

It further would have been obvious to one of ordinary skill in the art at the time the invention was made to select specific process parameters such as time and thickness within the ranges as combinatively suggested by Utumi, Parmenter and Yoshida, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Allowable Subject Matter

Claims 10 and 16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 17-19 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: none of the prior art of record, taken alone or in combination, fairly discloses all the limitations as claimed.

Re claim 17, none of the prior art of record discloses a method of forming a layer of AIN of desired thickness on a semiconductor substrate, the method comprising: using molecular beam epitaxy at a temperature less than approximately 300 degrees Celsius: applying a beam of Al; waiting a predetermined period; applying a beam of remote plasma RF nitrogen; waiting a predetermined period; and repeating application of the beams and waiting periods to produce the layer of AIN of desired thickness.

Response to Arguments

Applicant's arguments filed March 17, 2005 have been fully considered but some of the arguments are not persuasive.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the AlN layer being in direct contact with the surface of the HFET) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Furthermore, the phrase "to the top surface" does not have the same meaning as "in direct contact with the semiconductor surface". Just because an AlN layer is applied to the top surface of an HFET, it does not have to be in direct contact with the top surface. It might just as well be above the top surface. Regardless, the limitations of claim 1 do not require applying the AlN passivation layer to the entire top surface of the HFET. Thus, the AlN passivation can be interpreted as being applied to the top surface of any portion of the HFET. In this regard, it can be seen in FIG. 6 of the Huang reference that the AlN layer 25 is applied to the top surfaces of active portions 16-18 and contact layers 12 of the HFET device.

Applicant argues the AlN layer of Huang does not have the same electrochemical function as compared to the instant claimed invention. In response, the Examiner respectfully disagrees because both the layer 25 of Huang and that of the instant invention are indeed the same material (AlN). Thus, the two layers should perform the same function. Furthermore, the functional recitation "passivation" has not given patentable weight because it is narrative in form. In order to be given patentable weight, a functional recitation must be expressed as a

"means" for performing the specified function, as set forth 35 U.S.C. 112, 6th paragraph, and must be supported by recitation in the claim of sufficient structure to warrant the presence of the functional language. In re Fuller, 1929 C.D. 172; 388 O.G. 279.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Parmenter suggests the use of an MBE apparatus that utilizes alternate applications of molecular/ atomic beam sources 1 and 2 for approximately 0.2 seconds or less, or for any length of time required by the deposition process [see col. 2, lines 52-65]. Thus, one of ordinary skill in the art would have been motivated to form an AlN layer using such an MBE apparatus in order to achieve accurate dosage of material at the substrate.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh Duong whose telephone number is (571) 272-1836. The examiner can normally be reached on Monday - Thursday (9:00 AM - 6:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KBD

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